Determining the complex permittivity of oil palm empty fruit bunch fibre material by open-ended coaxial probe technique for microwave applications

ABSTRACT

A material description was established for oil palm empty fruit bunch (OPEFB) fibre waste for microwave absorber applications by determining its dielectric properties with respect to fibre size and frequency. The proposed OPEFB material was studied at frequencies from 1 to 4 GHz. The study was conducted using the open-ended coaxial probe (OECP) HP85071C technique. The effect of microwave frequency on complex permittivity properties for powdered OPEFB and compressed OPEFB with different particle sizes (100, 200, 300, 400, and 500 μm) were investigated. Results showed that the microwave frequency and particle size significantly influenced the complex permittivity (real and imaginary) properties of the samples. Moreover, the complex permittivity decreased as the powder fibre size increased. The complex permittivity of the smallest and largest powder fibre sizes (100 and 500 μm) were (2.050 − j 0.197) and (1.934 − j 0.137), respectively; and the complex permittivity of the smallest and largest compressed OPEFB fibre sizes (100 and 500 μm) were (3.799 − j0.603) and (3.326 − j0.486), respectively. The compressed OPEFB complex permittivity was higher than that of the OPEFB powder.

Keyword: Oil palm empty fruit bunch; Microwave; Permittivity; Open-ended coaxial